

National Weather Service
Regional and Local Climate Services

Implementation Plan

August 29, 2003

Letter from the Director Office of Climate, Water, and Weather Services

Advances in science now enable us to produce and deliver a seamless suite of products and services ranging from hours to seasons and beyond. Our customers are demanding better quality data and information and improved climate services. Climate change/variability is one of National Oceanic and Atmospheric Administration's (NOAA) priorities. To date, our climate services efforts have largely consisted of the development, production, and delivery of climate forecasts at the National Centers for Environmental Prediction's (NCEP) Climate Prediction Center (CPC), with customer interaction being accomplished on a piecemeal basis. The growing need for more and better climate services and NOAA's Strategic Plan demand a more organized, proactive, end-to-end climate services role:

To enable society to better respond to changing climate conditions, NOAA, working with national and international partners, will employ an end-to-end system comprised of integrated observations of key atmospheric, oceanic, and terrestrial variables; a scientific understanding of past climate variations and present atmospheric, oceanic, and land-surface processes that influence climate; application of this improved understanding to create more reliable climate predictions on all time scales; and service delivery methods that continuously assess and respond to user needs with the most reliable information possible.¹

NWS identified, in 2000, the need for a well-defined climate services program at all organizational levels. As part of the headquarters restructuring, the Climate Services Division (CSD) in the Office of Climate, Water, and Weather Services (OCWWS) was established. Since that time, the CSD has formulated a Professional Development Series for climate services and a training program to support it; worked with other NOAA components and partners to establish integrated climate services to better fit users' needs; designed and implemented a partnership program to develop and encourage partnerships with climate-interested entities (e.g., universities, regional climate centers, state climatologists, etc.); provided monetary and staff support to assist in the development and implementation of regional climate services programs; supported studies to facilitate regional and local analyses for climate prediction; and held numerous climate workshops. The NWS has also embraced the use of the internationally-accepted "The 10 Climate Monitoring Principles" for planning and operating our observing networks and has implemented policy to ensure maintenance of the integrity and continuity of the U.S. historical climate record.

¹New Priorities for the 21st Century – NOAA's Strategic Plan for FY2003 - FY2008 and Beyond, dated March 31, 2003

Last year, the Western Region (WR) within the NWS took several actions to increase the priority and improve the delivery of climate services, including establishing a Climate Services Program Manager position in their headquarters, forming a climate services steering committee comprised of headquarters and field personnel, developing a regional plan for climate services, and naming climate services focal points in each Weather Forecast Office and River Forecast Center.

The Pacific Region (PR) has for several years been supporting the Pacific ENSO (El Niño-Southern Oscillation) Applications Center (PEAC). This cooperative project, involving the Universities of Hawaii and Guam, PR, and the Pacific Basin Development Council, provides specialized climate support to meet the unique needs of the Hawaiian Islands and the U.S. affiliated Pacific Islands (i.e., Pacific insular states) through a website and a quarterly newsletter (*Pacific ENSO Update*). It also works directly with local governments to assess service needs and provide on-site training sessions for climate services and science issues.

Now the NWS must build on these successes and mobilize throughout its structure (i.e., regional and field offices) to improve delivery of climate services. To accomplish this, this plan, for regional and local climate services, was developed as the blueprint for this mobilization. This effort does not diminish the importance of the NWS's weather and water forecast and warning mission. Rather it demonstrates NWS awareness of the growth and importance of climate science and the opportunities it provides.

[SIGNED]

Gregory A. Mandt
Director, Office of Climate, Water, and Weather Services

CLIMATE SERVICES VISION

To be an integrated member of the climate community in the delivery of national, regional, and local climate services.

CLIMATE SERVICES MISSION

To deliver timely and quality climate forecasts, observations, information, and knowledge to users, in partnership with other members of the climate, water, and weather communities and, in doing so, meet the needs of the Nation.

PURPOSE OF THIS DOCUMENT

This plan establishes the process to implement a climate services program at all levels within the National Weather Service, and supports the National Research Council's 2001 study, *"A Climate Services Vision: First Steps Toward the Future,"* for the timely production and delivery of useful climate data, information, and knowledge to decisionmakers.

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INTRODUCTION

National Weather Service climate services consist of real-time monitoring, forecasting products and services, models and technology (model output), observations, and customer education, assistance, and outreach. The effective delivery of these services depends on the competent, focused attention of NWS personnel at all levels from national to local. This plan formalizes the process for developing the expanded capability local offices need to deliver these services, including the requisite responsibilities at the regional and national offices. Supporting documentation of how this will be done will follow in new directives, policies, and procedures.

At the national level, the Office of Climate, Water, and Weather Services (OCWWS) will set policy and requirements, secure and allocate resources, and act as the national coordinator for regional and local climate services. The CPC will continue to fulfill its responsibilities for applied science, technique and prototype development, and central monitoring and prediction.

The regional offices will ensure resources are available to the local offices, and provide tools, communications, and training to support the local offices' delivery of climate services. They also coordinate regional partnerships and climate service activities, acting as the interface for delivery of forecasts and observations. Activities include maintaining a continuing dialogue with CPC and regional partners to test tools and products for extension of CPC analyses and predictions consistently to local applications.

The local offices engage, advise, and inform local customers. They consistently extend CPC analyses and predictions locally, ensure integrity of observations and reporting of metadata*, and develop partnerships for local services.

At the completion of the implementation phase outlined here, NWS offices will be equipped with the materials and know-how to deliver routine climate services effectively.

*Metadata are "data about data". Metadata describe the content, quality, condition, and other characteristics of data, including any known errors or discontinuities. Metadata document each observing system and its operating procedures. Relevant information includes: instruments, instrument sampling time, calibration, validation, station location, exposure, local environmental conditions, and any other specifics that could influence the data history.

THE FIVE GOALS OF THE NWS'S CLIMATE SERVICES IMPLEMENTATION PLAN

The NWS has set five goals to implement regional and local climate services (Figure 1).

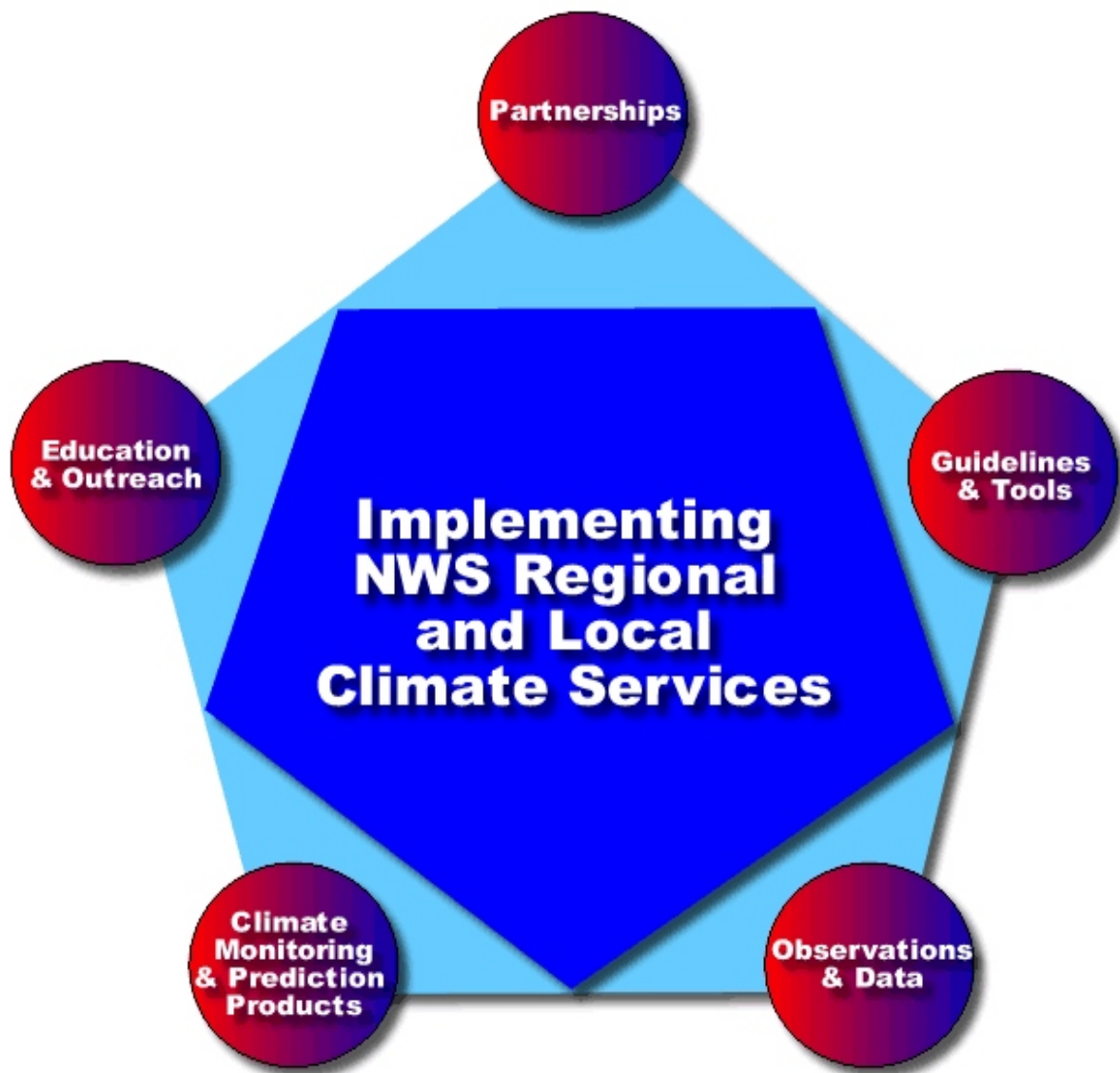


Figure 1
The Five Pillars/Goals of the NWS's Climate Services Implementation Plan

The **first goal** is to “organize and equip the regional and local offices with guidelines and tools to enhance climate services.” As the principal points of entry for requests for NOAA climate services and the dominant interface for NWS climate services, NWS Weather Forecast Offices (WFOs) need to name focal points for climate services and ensure their access to training in climate science and services to establish a qualified and confident workforce. NWS River Forecast Centers (RFCs) also need to name focal points for climate services and ensure their access to training in climate science and services to establish a qualified and confident workforce; their climate services will be in support of NWS WFOs and other agencies (e.g., USGS, COE, RBCs, etc). Regional headquarters need to forge the partnerships and manage the resources to support them.

The **second goal** is to “provide reliable, timely, accurate, and secure observations and metadata for the climate record.” One of the most critical aspect of the NWS mission is to provide the nation with weather and climate observations. Observations form the backbone for weather and climate products and services, and they are essential to the research of our planet’s past, present, and future climate. Observational data are used in a broad array of applications, ranging from support for short-term forecast and warning services to long-term research activities. Decisionmakers use the data for a variety of socioeconomic applications, including disaster relief, construction, energy planning, and agriculture. In addition, some data users view NWS observations as the benchmark for legal applications. NWS is viewed by many users and partners as the “neutral broker” of observational data, and NOAA observations are their dataset of choice. NWS operates many of the nation’s in-situ weather observing systems (COOP, ASOS, upper air, etc.). Historically, the operational observing systems, as well as quality control and data management algorithms, were built to support weather prediction and assessment efforts rather than the long-term climate record. Because costly socioeconomic decisions are based on the observations, NWS has renewed its commitment to data stewardship. As interest in global climate change and variability continues to grow, and as the economic costs of uncertainty mount, NWS must manage the nation’s observing systems with a firm commitment to support the needs of climate monitoring and assessment. Only by broadening the role of NWS as the caretaker of observing systems will the integrity of the long-term climate record be preserved.

The **third goal** is to “enhance and extend the Climate Prediction Center’s (CPC) product suite to increase the use and effectiveness of regional and local climate information.” Climate variability influences meteorological and hydrological events. New methods and procedures will enable local decisionmakers and users to better plan for impacts related to climate variability. Field offices have enhanced understanding of local climate conditions, extensive access to and familiarity with regionally- and locally-produced data records, and a thorough understanding of the forecast requirements of regional and local decisionmakers. CPC, on the other hand, principally focuses on the prediction of the large-scale modes of climate variability and regional-scale land surface processes and their manifestation at the scale of mega-climate divisions. Thus field offices can potentially provide substantial input to CPC’s monitoring and hazards assessment processes, as well as considerably enhance and extend CPC’s product suite for local applications. NWS must ensure that this product suite is developed using approved

“best practices” that will guarantee local forecasts are physically consistent with CPC’s.

The **fourth goal** is to “conduct education and outreach to regional and local customers of climate services.” Through interaction with partners and users, regional and local offices can inform and receive feedback from various customer groups on NWS climate services, observations, and prediction products. Forms of outreach include: workshops targeted toward a particular group of users or customers (i.e., agriculture, weather risk management, etc.); small meetings with a particular customer; forums for open discussion of a service or product; lectures to educate a group of users (i.e., media, students); and informational videos and materials distributed either widely or to a targeted audience. The intent of outreach is to help customers and users locate, understand, and apply climate products and services, and use their feedback and ideas to expand upon or improve existing products.

The **fifth goal** is to “establish strong partnerships with the climate community to facilitate collaborations in the delivery of regional and local climate services.” The delivery of climate services requires the partnership and collaboration with other members of the climate community, including other NOAA and government agencies, Regional Climate Centers, State Climatologist Offices, universities, industries, and private sector climatologists. NWS regional and local offices need to foster partnerships to become full participants in an emerging national infrastructure for the delivery of climate services. Achievement of Goals 1-4 of this plan, including training, observations, climate prediction, and outreach, relies upon the formation of strong partnerships with the regional and local climate community.

Using these five pillars as the foundation, the NWS will solidify its climate services at the Headquarters, regional, and local levels. At the same time, the NWS will continue to establish and/or strengthen its partnerships and working relationships with others in the climate community. Also, through research infused into operations, NWS will continue to improve its climate observations and forecasts so that stakeholders will have climate-related information available to them when they need it, in formats they can use, and in ways they can understand. These collaborative efforts will continue to build toward the ultimate goal of enhancing economic vitality and environmental quality by mitigating adverse impacts of climate variations. The following pages outline how the initial work of building the foundation via this implementation plan will be accomplished at all levels within the NWS.

ACTIONS, PLANNED IMPLEMENTATION DATES, AND REQUIRED RESOURCES

Goal 1: Organize and equip the regional and local offices with guidelines and tools to enhance climate services

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Designate an NWS Headquarters program manager for regional climate services (FY03/Q2)	Designate a liaison for regional climate services (FY03/Q2)	Appoint a Regional Climate Services Program Manager/ Leader (FY03/Q2)	Appoint Climate Focal Points (FY03/Q4)	Appoint Climate Focal Points (FY03/Q4)
Manage the climate services Partnership Program (FY03/Q2 - ONGOING)	Provide instructional guidance to Partnership Program participants (FY03/Q2 - ONGOING)	Ensure that the regional climate services program manager/leader participates in the CSD's Partnership Program (FY03/Q4 - ONGOING)	Encourage participation of climate focal point in the CSD's Partnership Program (FY04/Q1 - ONGOING)	Encourage participation of climate focal point in the CSD's Partnership Program (FY04/Q1 - ONGOING)
Manage and allocate resources (i.e., funding, personnel, training, etc.) for climate services (FY03/Q2 - ONGOING)	Manage and allocate personnel for climate services (FY03/Q2 - ONGOING)	Manage and allocate resources (i.e., funding, personnel, training, etc.) for climate services (FY03/Q4 - ONGOING)	Manage resources (i.e., funding, personnel, training, etc.) for climate services (FY04/Q1 - ONGOING)	Manage resources (i.e., funding, personnel, training, etc.) for climate services (FY04/Q1 - ONGOING)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Provide guidance and tools (i.e., Instructional Components for professional development in the area of climate science and services (FY03/Q2 - ONGOING)	Assist CSD in providing guidance and tools for professional development in the area of climate science and services (FY03/Q2 - ONGOING)	Ensure professional development in the area of climate science and services for the regional climate services program manager/leader and assist with such professional development for the climate focal points (FY03/Q4 - ONGOING)	Ensure professional development in the area of climate science and services for the climate focal point (FY04/Q1 - ONGOING)	Ensure professional development in the area of climate science and services for the climate focal point (FY04/Q1 - ONGOING)
Participate, when applicable, as instructors and participants in the COMET climate symposia (FY03/Q3 - ONGOING)	Participate, when applicable, as instructors and participants in the COMET climate symposia (FY03/Q3 - ONGOING)	Ensure that the regional climate services program manager/leader attends a COMET climate symposium and manage attendance by local offices' climate focal points (FY03/Q4 - ONGOING)	Ensure the attendance of at least one qualified staff member (preferably, the climate focal point) to attend a COMET climate symposium, who will train the office upon return (FY04/Q1 - ONGOING)	Ensure the attendance of at least one qualified staff member (preferably, the climate focal point) to attend a COMET climate symposium, who will train the office upon return (FY04/Q1 - ONGOING)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Provide primary assistance in the development of regional and local climate services plans (FY03/Q4 - ONGOING)	Provide technical assistance, as needed, in the development of regional and local climate services plans (FY03/Q4 - ONGOING)	Develop and implement a regional climate services plan based on the national plan (FY04/Q1)	Implement regional climate services plan (FY04/Q2)	Implement regional climate services plan (FY04/Q2)
Update and maintain the climate Professional Development Series (PDS) and complete development of all Instructional Components (ICs) (major development = FY04/Q1, updates = ONGOING)	Provide technical and instructional support to IC development and execution (major development = FY04/Q1, updates = ONGOING)	Coordinate regional participation in climate PDS (FY04/Q2 - ONGOING)	Schedule and complete appropriate training based on the climate PDS (FY04/Q2 - ONGOING)	Schedule and complete appropriate training based on the climate PDS (FY04/Q2 - ONGOING)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Create national climate services policy and directives based on approved national climate services plan (FY04/Q1 - ONGOING)	Implement the national climate services policy and directives, and supplement, as necessary (FY04/Q1 - ONGOING)	Implement the national climate services policy and directives, and supplement, as necessary (FY04/Q2 - ONGOING)	Implement national and regional climate services policy and directives, and create local procedures to achieve this (FY04/Q3 - ONGOING)	Implement national and regional climate services policy and directives, and create local procedures to achieve this (FY04/Q3 - ONGOING)

Required Resources:

- Funding and staff time (at national level) to support all aspects of PDS, training, Partnership Program, and appropriate science projects
- Staff hours (at all levels) for training participation
- Funding and staff hours (at headquarters, regional, and local levels) for management and conduct of climate services programs

Goal 2: *Provide reliable, timely, accurate, and secure observations and metadata for the climate record*

NWS operates many of the nation's in-situ weather observing systems (COOP, ASOS, upper air, etc.). Historically, the operational observing systems, as well as quality control and data management algorithms, were built to support weather prediction and assessment efforts rather than the long-term climate record. Because costly socioeconomic decisions are based on the observations, NWS has renewed its commitment to data stewardship. As interest in global climate change and variability continues to surge, and as the economic costs of uncertainty grow, NWS must manage the nation's observing systems with a renewed commitment to support the needs of climate monitoring and assessment. Only by broadening the role of NWS as the caretaker of observing systems will the integrity of the long-term climate record be preserved.

Actions and Planned Implementation Dates:

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Develop outreach materials for use by field and volunteer observers on the importance of accurate observations and metadata (FY03/Q4)	Collaborate with NWS Headquarters to ensure that quality examples, reflecting the importance of accurate observations and metadata, are included in outreach materials for use by field and volunteer observers on the importance of accurate observations and metadata (FY03/Q4)	Distribute outreach materials for use by field and volunteer observers on the importance of accurate observations and metadata to field and volunteer observers, and conduct outreach activities (FY04/Q1)	Educate field and volunteer observers as to the importance of accurate observations and metadata (FY04/Q2 - ONGOING)	Collaborate with NWS Headquarters to ensure that quality examples, reflecting the importance of accurate observations and metadata, are included in outreach materials for use by field and volunteer observers on the importance of accurate observations and metadata (FY03/Q4)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Develop and maintain national standards for instrument accuracy and exposure, data quality, and timeliness (FY03/Q4 - ONGOING)	Provide requirements to NWS Headquarters, as needed, on developing and maintaining national standards for instrument accuracy and exposure, data quality, and timeliness (FY03/Q4 - ONGOING)	Monitor observations network performance to ensure that national standards are met for instrument accuracy and exposure, data quality, and timeliness (FY04/Q1 - ONGOING)	Monitor local observations network performance and respond to network problems in a timely manner (FY04/Q1 - ONGOING)	Provide requirements to NWS Headquarters, as needed, on developing and maintaining national standards for instrument accuracy and exposure, data quality, and timeliness (FY04/Q1 - ONGOING)
Develop data continuity plans for observing systems (FY03/Q4 - ONGOING)	Provide input for data continuity plans to national headquarters, as appropriate (FY03/Q4 - ONGOING)	Ensure that NWS observing systems are managed with data continuity plans (FY04/Q1 - ONGOING)	Ensure that NWS observing systems are managed with data continuity plans (FY04/Q1 - ONGOING)	Provide input for data continuity plans to national headquarters, as appropriate (FY04/Q1 - ONGOING)
Develop a strategic plan for the NWS part of a national climate observation network, leveraging the NWS in-situ networks (FY04/Q1)	Ensure NCEP user requirements are addressed within the strategic plan for the NWS part of a national climate observation network (FY04/Q1)	Facilitate COOP modernization activities per the strategic plan for the NWS part of a national climate observation network (FY04/Q2)	Provide site support for COOP locations per the strategic plan for the NWS part of a national climate observation network (FY04/Q3)	Ensure RFC user requirements are addressed within the strategic plan for the NWS part of a national climate observation network (FY04/Q1)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Develop policy so in situ observing programs can adhere to the “10 climate monitoring principles” (Appendix 1) (FY04/Q1)	Provide input on policy for adherence to the “10 climate monitoring principles” (Appendix 1) to national headquarters, as appropriate (FY04/Q1)	Supplement, as necessary, national policy so in situ observing programs can adhere to the “10 climate monitoring principles” (reference Appendix 1) (FY04/Q2)	Implement national policy and regional supplement, if applicable, regarding adherence of in situ observing programs to the “10 climate monitoring principles” (reference Appendix 1) (FY04/Q3)	Provide input on policy for adherence to the “10 climate monitoring principles” (Appendix 1) to national and regional headquarters, as appropriate (FY04/Q1)
Develop policy for the collection, maintenance, and dissemination of timely and accurate metadata (FY04/Q1)	Provide input on the policy for the collection, maintenance, and dissemination of timely and accurate metadata to national headquarters, as appropriate (FY04/Q1)	Supplement policy for the collection, maintenance, and dissemination of timely and accurate metadata, as necessary, and ensure two-way regional coordination with climate services partners. Implement and ensure adherence to the national policy (FY04/Q2)	Implement national and regional policies for the collection, maintenance, and dissemination of timely and accurate metadata and ensure two-way coordination with climate services partners (FY04/Q3)	Provide input on the policy for the collection, maintenance, and dissemination of timely and accurate metadata to national and regional headquarters, as appropriate (FY04/Q1)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Develop policy for the integration of complementary data into an integrated national observation network (FY04/Q1)	Provide user input into the development of standards for an integrated national observation network (FY04/Q1)	Supplement national policy, as necessary, to ensure regional coordination and integration of complementary data into an integrated national observation network (FY04/Q2 - ONGOING)	Identify candidate local complementary observation networks for inclusion in an integrated national observation network (FY04/Q3 - ONGOING)	Provide user input into the development of standards for an integrated national observation network (FY04/Q3)
Develop national standards for dissemination of climate observations and data products (FY04/Q4)	Ensure data products meet national standards for dissemination of climate observations and data products (FY05/Q1 - ONGOING)	Ensure regional and local observations and data products meet national standards for dissemination of climate observations and data products (FY05/Q2 - ONGOING)	Ensure local observations and data products meet national standards for dissemination of climate observations and data products (FY05/Q3 - ONGOING)	Ensure data products meet national standards for dissemination of climate observations and data products (FY05/Q3 - ONGOING)

Required Resources:

- Staff time (at the national level) are required to develop a new climate Professional Competency Unit (PCU) within the climate Professional Development Series
- Staff time (at the regional and local levels) for personnel to receive training
- Funding and staff time (at the regional level) to integrate mesonets into national surface observing network
- Staff time (at all levels) to develop and monitor performance measures to verify compliance with national standards for installation and maintenance of observing stations
- Staff time (at the regional and local levels) to manage observing systems with “The 10 Climate Monitoring Principles”
- Staff time (at the national and regional levels) to develop data continuity plans for observing systems
- Resources for conducting parallel testing (communications/extra equipment/maintenance costs)
- Staff time (at the national, regional, and local levels) to develop and implement strategic and supplemental plans
- Staff (at the national, regional, and local levels) to develop, monitor, and implement national standard formats for observations, data products, and metadata
- Staff time (at the regional level) to develop two-way communication with regional and state climate services partners

Goal 3: *Enhance and extend Climate Prediction Center's (CPC) product suite to increase the use and effectiveness of regional and local climate information*

Actions and Planned Implementation Dates:

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Provide input to CPC and management support for coordination of input from regions and partners to CPC on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others* (FY03/Q2 - ONGOING)	Solicit and synthesize input from regions and partners on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others* (FY03/Q2 - ONGOING)	Collect, synthesize, and communicate input from partners and local offices to CPC on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others* (FY03/Q4 - ONGOING)	Provide input to regional headquarters on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others* (FY03/Q4 - ONGOING)	Provide input to regional headquarters on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and RFC products such as Ensemble Streamflow Prediction* (FY03/Q4 - ONGOING)
Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (FY03/Q2 - ONGOING)	Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (FY03/Q2 - ONGOING)	Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (FY03/Q4 - ONGOING)	Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (FY03/Q4 - ONGOING)	Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (FY03/Q4 - ONGOING)

*Refer to Appendix 2 – "NWS Climate Forecast Operations Concept"

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Solicit feedback at monthly teleconferences with regional climate services program managers/ leaders to improve existing climate services products and for the design of new ones (FY03/Q2 - ONGOING)	Receive and respond to feedback to improve existing climate products and to develop new ones (FY03/Q2 - ONGOING)	Solicit feedback from local offices and regional customers for monthly teleconferences with CSD to improve existing climate services products and for the design of new ones (FY03/Q4 - ONGOING)	Solicit feedback, on a regular basis, from customers to improve existing climate services products and for the design of new ones (FY03/Q4 - ONGOING)	Provide feedback to regional headquarters and supported WFOs to improve existing climate products and to develop new ones (FY03/Q4 - ONGOING)
Facilitate communication among regions, field offices, and members of the user community in the development of products (FY04/Q1 - ONGOING)	Receive and respond to feedback from national and regional members of the user community, regions, and field offices to facilitate development of products (FY04/Q1 - ONGOING)	Support flow of information among field offices, NWS headquarters, and regional members of the user community, and collaborate to develop joint regional products (FY04/Q2 - ONGOING)	Collaborate and partner with other field offices and members of the user community to develop joint products (FY04/Q3 - ONGOING)	Support affiliated WFOs in the development of joint products (FY04/Q3 - ONGOING)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Provide guidance to regions for conducting regional and local studies* (FY05/Q1)	Provide tools to regions for conducting regional and local studies* (FY05/Q1)	Investigate opportunities for regional and local studies, use guidance and tools to conduct regional studies, and provide guidance and tools to local offices for conducting local studies* (FY05/Q2 - ONGOING)	Investigate opportunities for local studies, and use guidance and tools to conduct studies* (FY05/Q3 - ONGOING)	Investigate opportunities for local studies, and use guidance and tools to conduct studies* (FY05/Q3 - ONGOING)
Facilitate coordination between NCEP and regions in generating techniques to produce local conditional climatologies based on modes of climate variability* (FY05/Q2)	Develop, with regions, techniques for all local offices to use in generating local conditional climatologies based on modes of climate variability* (FY05/Q2)	Support development of techniques for local offices to use in generating local conditional climatologies and, where needed, serve as a testbed for transition to operations* (FY05/Q3)	Develop local conditional climatologies based on modes of climate variability* (FY05/Q4)	Support WFO development of local hydrologic climatologies and coordinate and mosaic local conditional climatologies from WFOs* (FY05/Q4)

*Refer to Appendix 2 – “NWS Climate Forecast Operations Concept”

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Facilitate coordination between NCEP and regions in generating guidance and methodologies to quantitatively downscale CPC forecast products* (FY05/Q2)	Develop, with regions, guidance and methodologies for all local offices to quantitatively downscale CPC forecast products* (FY05/Q2)	Support development of guidance and downscaling methodologies for all local offices to use and, where needed, serve as a testbed for transition to operations* (FY05/Q3)	Develop local climate products downscaled from CPC forecast products* (FY05/Q4)	Assure coordination of long-range hydrologic forecasts and local climate predictions for hydrologic service area (FY05/Q4)

Required Resources:

- Funding (at all levels) for travel to collaborate in product development
- Staff hours for appropriate personnel (at all levels) for product development and testing

*Refer to Appendix 2 – “NWS Climate Forecast Operations Concept”

Goal 4: *Conduct education and outreach to regional and local customers of climate services*

For more information on the training available, see Appendices 5 and 6 in this document and the following Websites:

The PDS Website:

<http://www.nws.noaa.gov/om/csd/pds/index.htm>

Residence Training:

<http://www.nws.noaa.gov/om/csd/pds/pcu2/index.htm>

Self-guided, interactive, online training:

<http://www.nws.noaa.gov/om/csd/pds/pcu3/index.htm>

Webcast:

<http://www.comet.ucar.edu/modules/index.htm>

Teletraining:

<http://www.nws.noaa.gov/om/csd/pds/pcu4/index.htm>

Actions and Planned Implementation Dates:

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Identify customer requirements for climate services (FY03/Q2 - ONGOING)	Provide support, as needed, in identifying customer requirements for climate services (FY03/Q2 - ONGOING)	Identify customer requirements for regional and local climate services (FY03/Q4 - ONGOING)	Identify customer requirements for local climate services (FY04/Q1 - ONGOING)	Identify customer requirements for hydrologic climatology services (FY04/Q1 - ONGOING)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Engage partners in climate outreach activities (FY03/Q2 - ONGOING)	Assist NWS headquarters in engaging partners for climate outreach activities (FY03/Q2 - ONGOING)	Encourage partnerships between regional and local offices for climate outreach activities, and engage regional partners (FY03/Q4 - ONGOING)	Engage partners in climate outreach activities (FY04/Q1 - ONGOING)	As applicable, engage partners in climate outreach activities (FY04/Q1 - ONGOING)
Coordinate and conduct outreach to customers and users on climate services and products (FY03/Q2 - ONGOING)	Support outreach to customers and users on climate services and products (FY03/Q2 - ONGOING)	Coordinate and conduct outreach to regional customers and users on regional and local climate services and products (FY04/Q1 - ONGOING)	Coordinate and conduct outreach to local customers and users on local climate services and products (FY04/Q2 - ONGOING)	Coordinate and conduct outreach to local customers and users on hydrologic climatology services and products (FY04/Q2 - ONGOING)
Provide materials and tools for national climate services outreach (FY03/Q2 - ONGOING)	Provide support to developing materials and tools for national climate services outreach (FY03/Q2 - ONGOING)	Provide materials and tools for regional climate services outreach (FY04/Q1 - ONGOING)	Provide materials and tools for local climate services outreach (FY04/Q2 - ONGOING)	Provide hydrologic climatology materials and tools for climate services outreach (FY04/Q2 - ONGOING)

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Conduct at least three climate outreach activities per year, including two face-to-face activities (FY04/Q4 - ONGOING)	Participate, as needed, in climate outreach activities (FY04/Q1 - ONGOING)	Set yearly goals for regional and local offices for number of climate outreach activities per year, including face-to-face interactions, and conduct at least the target number of climate outreach activities (FY04/Q1 - ONGOING)	Conduct at least the number of climate outreach activities set by regional headquarters, including face-to-face interactions (FY04/Q4 - ONGOING)	Conduct at least the number of climate outreach activities set by regional headquarters, including face-to-face interactions (FY04/Q4 - ONGOING)

Required Resources:

- Funding (at all levels) for development and distribution of materials (brochures, videos, etc.) for climate services outreach
- Funding and staff hours (at all levels) for appropriate personnel to travel to establish and maintain communication with customers, plan and attend workshops, and prepare materials, as needed

Goal 5: *Establish strong partnerships with the climate community to facilitate collaborations in the delivery of regional and local climate services*

Actions and Planned Implementation Dates:

NWS Headquarters	NCEP	Regional Headquarters	Local Offices (WFOs)	Local Offices (RFCs)
Identify climate partners (FY03/Q2 - ONGOING)	Provide input in identifying climate partners (FY03/Q2 - ONGOING)	Identify regional and local climate partners (FY04/Q1 - ONGOING)	Identify local climate partners (FY04/Q1 - ONGOING)	Identify local climate partners (FY04/Q1 - ONGOING)
Collaborate with the climate community on expansion, improvement, and delivery of NWS climate services (FY03/Q2 - ONGOING)	Collaborate with the climate community on expansion, improvement, and delivery of NWS climate services (FY03/Q2 - ONGOING)	Collaborate with regional climate services partners on expansion, improvement, and delivery of regional and local climate services (FY04/Q1 - ONGOING)	Collaborate with local climate services partners on expansion, improvement, and delivery of local climate services (FY04/Q1 - ONGOING)	Collaborate with local climate services partners on expansion, improvement, and delivery of local climate services (FY04/Q1 - ONGOING)
Facilitate communication among climate partners in the joint development of products (FY04/Q1 - ONGOING)	Communicate with national and regional climate partners to facilitate joint development of products (FY04/Q1 - ONGOING)	Facilitate communication with regional and local climate partners, and collaborate to develop joint regional products (FY04/Q2 - ONGOING)	Collaborate with regional and local climate partners to develop joint products (FY04/Q3 - ONGOING)	Collaborate with regional and local climate partners to develop joint products (FY04/Q3 - ONGOING)

Required Resources:

- Funding and staff time (at all levels) for travel to establish and maintain partnerships, collaborate with partners, and develop products jointly with partners

- Funding through NCTP (see Appendix 3 for draft plan) for prototype-to-operations projects

APPENDIX 1
The 10 Climate Monitoring Principles

APPENDIX 1 – The 10 Climate Monitoring Principles*

United States Climate Reference Network: Climate Monitoring Principles
National Climatic Data Center, 10 April 2000

The National Research Council (NRC 1999) recommended that the following ten climate monitoring principles, proposed by Karl et al. (1995), should be applied to climate monitoring systems:

1. MANAGEMENT OF NETWORK CHANGE

Assess how and the extent to which a proposed change could influence the existing and future climatology obtainable from the system, particularly with respect to climate variability and change. Changes in observing times will adversely affect time series. Without adequate transfer functions, spatial changes and spatially dependent changes will adversely affect the mapping of climatic elements.

2. PARALLEL TESTING

Operate the old system simultaneously with the replacement system over a sufficiently long time period to observe the behavior of the two systems over the full range of variation of the climate variable observed. This testing should allow the derivation of a transfer function to convert between climatic data taken before and after the change. When the observing system is of sufficient scope and importance, the results of parallel testing should be documented in peer-reviewed literature.

3. METADATA

Fully document each observing system and its operating procedures. This is particularly important immediately prior to and following any contemplated change. Relevant information includes: instruments, instrument sampling time, calibration, validation, station location, exposure, local environmental conditions, and other platform specifics that could influence the data history. The recording should be a mandatory part of the observing routine and should be archived with the original data. Algorithms used to process observations need proper documentation.

Documentation of changes and improvements in the algorithms should be carried along with the data throughout the data-archiving process.

4. DATA QUALITY AND CONTINUITY

Assess data quality and homogeneity as a part of routine operating procedures. This assessment should focus on the requirements for measuring climate variability and change, including routine evaluation of the long-term, high-resolution data capable of revealing and documenting important extreme weather events.

5. INTEGRATED ENVIRONMENTAL ASSESSMENT

Anticipate the use of data in the development of environmental assessments, particularly those pertaining to climate variability and change, as a part of a climate observing system's strategic plan. National climate assessments and international assessments (e.g., international ozone or IPCC) are critical to evaluating and maintaining overall consistency of climate data sets. A system's participation in an integrated environmental monitoring program can also be quite beneficial for maintaining climate relevancy. Time series of data achieve value only with regular scientific analysis.

6. HISTORICAL SIGNIFICANCE

Maintain operation of observing systems that have provided homogeneous data sets over a period of many decades to a century or more. A list of protected sites within each major observing system should be developed, based on their prioritized contribution to documenting the long-term climate record.

7. COMPLEMENTARY DATA

Give the highest priority in the design and implementation of new sites or instrumentation within an observing system to data-poor regions, poorly observed variables, regions sensitive to change, and key measurements with inadequate temporal resolution. Data sets archived in non-electronic format should be converted for efficient electronic access.

8. CLIMATE REQUIREMENTS

Give network designers, operators, and instrument engineers climate monitoring requirements at the outset of network design. Instruments must have adequate accuracy with biases sufficiently small to resolve climate variations and changes of primary interest. Modeling and theoretical studies must identify spatial and temporal resolution requirements.

9. CONTINUITY OF PURPOSE

Maintain a stable, long-term commitment to these observations, and develop a clear transition plan from serving research needs to serving operational purposes.

10. DATA AND METADATA ACCESS

Develop data management systems that facilitate access, use, and interpretation of data and data products by users. Freedom of access, low cost mechanisms that facilitate use (directories, catalogs, browse capabilities, availability of metadata on station histories, algorithm accessibility and documentation, etc.), and quality control should be an integral part of data management. International cooperation is critical for successful data management.

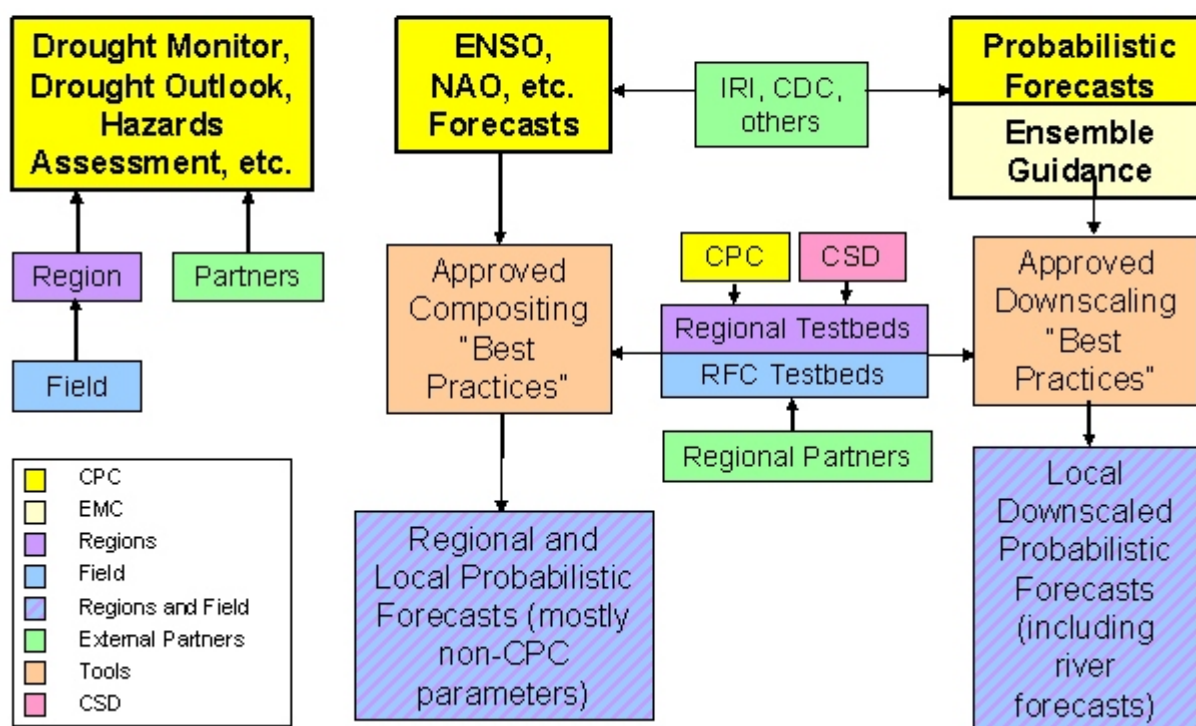
References:

Karl, T. R., V. E. Derr, D. R. Easterling, C. K. Folland, D. J. Hoffman, S. Levitus, N. Nicholls, D. E. Parker, and G. W. Withee, 1995: "Critical issues for long-term climate monitoring". *Climatic Change*, 31, 185-221.

National Research Council (NRC), 1999: *Adequacy of Climate Observing Systems*, National Academy Press, Washington, D.C

APPENDIX 2
NWS Climate Forecast Operations Concept

APPENDIX 2 – NWS Climate Forecast Operations Concept



APPENDIX 3

NOAA Climate Transition Program (NCTP)

Authors:

Fiona Horsfall
NWS/Climate Services Division
Harvey Hill
OAR/Office of Global Programs

APPENDIX 3 – NOAA Climate Transition Program (NCTP)

March 10, 2003

Introduction

This document describes a proposed NOAA Climate Transition Program (NCTP). NCTP is a comprehensive program with a well-defined management structure for expanding regional climate services. It provides a mechanism for supporting research that addresses user needs and requirements, transitioning the research to operations, and providing education and outreach capacity for new products.

Background

A major element of the Climate Change Research Initiative (CCRI) is the commitment to incorporating scientific results into decision support resources that meet national and regional requirements. At the regional level, the initiative resonates the need for advancing climate science, building scientific capacity, supporting communications between the research community and decisionmakers, and developing products that meet user needs.

NOAA's climate initiatives in recent years have articulated a vision for developing a nationwide capacity to provide customer-driven regional climate services. This vision supports the National Research Council's Board on Atmospheric Sciences and Climate's (BASC) 2001 study, *A Climate Services Vision: First Steps Toward the Future*, which made recommendations for building robust U.S. climate services.

One recommendation made by BASC was to "ensure a strong and healthy transition of U.S. research accomplishments into predictive capabilities that serve the nation." NOAA's Regional Decision Support and Services (RDSS) initiative addresses this recommendation. RDSS is a comprehensive strategy to support regional policy and management decisions by bolstering existing research and outreach capacity and formalizing collaborations within the climate community. RDSS will support the transition of applications from research to operations where they can be applied directly to climate-sensitive systems.

Without a clearly defined mechanism for driving collaborations, the climate community frequently resorts to ad hoc methods and processes and the "old" linear model of research. In the old model, the research community identifies operational needs and delivers the fruits of the research to the operational community, which then feeds the information to the users/decisionmakers. Because this process has proven to be inadequate, NOAA now proposes to support climate community collaborations for transitioning research to applications through the NCTP.

NOAA Climate Transition Program (NCTP)

The NCTP is a competitive program that supports transition of climate information tools and management insights into user-relevant products. It facilitates the development of new or enhanced regional products, information delivery technology, and sustained and systematic communication and feedback, especially at the grass roots level. The program goals are to focus NOAA funds to facilitate transition of climate information tools such that the program will:

- Respond to user/decisionmaker requirements
- Develop a deliberate bridge for research to applications
- Advance focused scientific research
- Increase scientific capacity
- Support interactive learning
- Develop infrastructure
- Adapt as the demand for climate services increases

The program objective is:

To define a structure for regional research projects such that they can be effectively responsive to user needs and result in products of value to regional/local climate-sensitive decision-making processes.

Following a Letter of Intent, the program will entertain proposals for funding from the climate community and encourages interdisciplinary topics. The climate community is made up of NOAA and other federal agencies, universities, Regional Integrated Sciences and Assessments centers, Regional Climate Centers, State Climatologists, as well as other private-sector groups. The proposals will have to meet specific criteria, as well as address the program goals and objective.

NCTP Criteria for Proposals

The NCTP is based on a “unit model” (Figure 1) that defines the interactions among “unit” participants or components, representing research, operations, extension, and the decisionmaker (user). Within the unit, participants will collaborate to identify a problem, develop a prototype solution and product, and transition the product to operations. Unit collaborations will facilitate providing education and outreach to the user community on the use of the product.

Problem identification will result from collaboration between the user community (decisionmakers) and a research component. An appropriate operational component will work with the research component to identify methodologies for prototype development and transition to operations. To fully define the unit, an extension service will be an integral part of the entire process to understand the problem and the product to be developed as a solution. It will design activities that effect behavior change through

constituent-
programs to
new product
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r.

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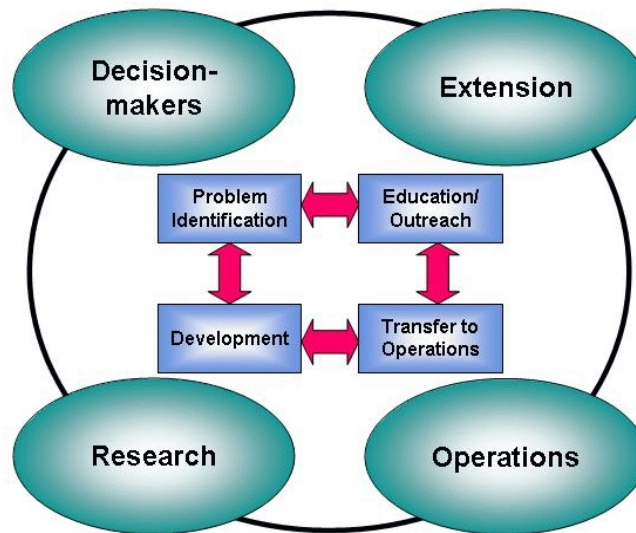


Figure 1 NCTP Unit Model

The unit components will be identified and defined explicitly within the proposal. One entity may act as more than one component, but cannot act as the entire unit as collaborations with other members of the climate community are required. The unit is envisioned as a capsule to address and solve a specific decisionmaker problem and provide a suitable, clearly-stated outcome.

To ensure collaborations among the components, one criterion for the proposals is participant contributions should be clearly defined. This may be in the form of matching funds, personnel support, or other contributions to the development of the outcome. The proposal should address a methodology for maintaining the outcome in an operational mode. Cooperative agreements among the participants must also be a part of each proposal, and these may be represented as signatures on the proposal and/or more formal documents addressing contributions.

Proposals should have a statement of duration not to exceed five years. As part of the criteria, a project time line must be submitted articulating project milestones. Also, a

benefit analysis should be included that addresses either the cost benefit, benefit to protecting life and property, or other measurable benefit. Post audit issues such as product validation, verification, and refinement requirements for the future should also be addressed, and the expected outcome must be clearly defined.

An example of a unit may be a manager of a dam (decisionmaker/user) who wishes to regulate flow through the dam on a daily basis. A researcher at a university may conduct research to establish river flow upstream and combine that information with climatological rainfall amounts, and work with an operational entity at the dam who will develop a product to determine daily flows through the dam structure. An extension component would work with the decisionmaker, the researcher, and the operational entity to establish what the flow ranges will be, and the effects of the changes to local and downstream community. It would educate the community, which may be local farmers, fishermen, sportsmen, etc. such that they modify their activities to take advantage of changes in flow from the dam.

NCTP Management

The program will be managed by a program manager in the NOAA Climate Office (NCO). The program manager will be responsible for developing program announcements and managing resources and the peer review process. Proposal review will leverage NOAA's existing infrastructure for review processes, such as those in the Sea Grant Office which include both NOAA and external reviewers. The program manager will make final decisions for funding based on the program priorities, peer reviews, and the recommendations of an advisory panel which will include representation from all NOAA line offices and will be appointed by the NCO Climate Board. The Climate Board will be responsible for setting program priorities annually. The NCO Director will be the approving official.

Each unit submitting a proposal will be categorized based on the type of project (agriculture, fisheries, hydrology, etc.), and will be required to provide semi-annual updates demonstrating that project milestones are being met. At the end of the project, in addition to a final project report, a sample of the product developed must be provided to the program management.

NCTP Proposal Process

Letters of Intent addressing the unit model concept will be solicited from the climate community. Following a positive response from the program manager, a formal proposal will be required. A standardized format for the proposals will be made available to interested parties. The proposal must clearly demonstrate that the project is user-oriented and has value to regional and/or local climate-sensitive decision-making processes, and the outcome must be clearly defined.

NCTP Review Process

Once a proposal has been submitted, it will undergo an initial review process to ensure it meets the proposal criteria and the standardized format required by the program. Further review will be conducted in two stages by the program management.

First, the managing office will be responsible for organizing and convening a review panel of experts in climate services and related fields. Reviewers will be asked to objectively assign a merit value to the proposals they are reviewing.

The program management will then make final selection of projects to be funded. Their decision will be based on the scaled recommendations of the merit reviewers, funding allocations, and the project value to regional and/or local climate-sensitive decision-making processes.

NCTP Funding Requirements

Several projects have been identified that can satisfy the proposal criteria. Program “seed” money (\$300K), would fund three to four demonstration projects and establish the program as a successful component of NOAA’s expansion of climate services. NWS has promised \$60K, an additional \$120K has been requested from NCO, and others are also being solicited.

The program is explicitly included in the FY05 Climate Initiative as a method for transition of research to operations under the Regional Decision Support and Services component. Full capacity for the first three years would fund 20 projects per year. The program is expected to develop further in subsequent years as regional climate services expand to meet user needs. NCO will have the authority to set proposal type priorities in future Requests for Proposals.

Summary

The NOAA Climate Transition Program is a model for proposal-driven climate-sensitive research. The program leverages the existing NOAA infrastructure as well as that of other government and private climate offices. It promotes regional research and capacity building at research institutions, and promotes the delivery of effective climate information and products to regional and local decisionmakers/users.

The program establishes a well-defined management process which will enable it to be quickly implemented propelling NOAA forward in the climate services arena. The program will be open to the climate community, including the private sector, and it will encourage the most efficient transition of research to applications of climate services. For NOAA, NCTP integrates line office participation in climate services, and supports a matrix management structure for regional climate research and services.

The NCTP model provides a methodology for user-driven research to deliver useful products, and can therefore, with modification, be applied to other research sectors.

NCTP Support

During the development of NCTP, input was solicited from several climate experts and experts from other research communities. To date, all those solicited have expressed their support for the program. Those solicited include:

Mary Glackin, NCO
David Goodrich, NCO
Susan Avery, Director, Cooperative Institute for Research in Environmental Sciences
Greg Mandt, Director, Office of Climate, Water, and Weather Services, NOAA NWS
Roger Pulwarty, Cooperative Institute for Research in Environmental Sciences
Kelly Redmond, Deputy Director, Western Regional Climate Center
James J. O'Brien, Florida State University and Florida State Climatologist
Roger Pielke, Sr., President, American Association of State Climatologists (AASC) and Colorado State Climatologist
John M. Grymes III, Past President, AASC and Louisiana State Climatologist
David Robinson, President-Elect, AASC and New Jersey State Climatologist
David Rogers, Office of Weather and Air Quality, NOAA Research
Jack Hayes, Office of Science and Technology, NOAA NWS
Jim Murray, Assistant Director for Outreach, NOAA Sea Grant
Ronald Baird, Director, NOAA Sea Grant
General Jack Kelly, Director, National Weather Service
Vickie Nadolski, Director, Western Region, NOAA NWS
Tom Karl, Director, NCDC
Sharon LeDuc, Deputy Director, NCDC
Mike Helfert, Regional Program Manager, NCDC

NCTP Milestones through January 2004

January 2003	Define standardized proposal format
January 2003	Procure "seed" money (\$300K) to fund three or four projects
January 2003	Submit FY05 Climate Initiative to NWS and NCO with funding request for NCTP
February 2003	Request formal Letters of Intent from prototype projects
February 2003	Request formal proposals from prototype projects
February 2003	Fund prototype projects
March 2003	Develop formal program management structure
June 2003	Develop a program website
August 2003	Present program to AASC at annual meeting
August 2003	First report due from prototype projects
August 2003	Start to establish funding sources for FY04
September 2003	Develop program announcement
November 2003	Solicit Letters of Intent for prototype projects for FY04
December 2003	Respond to Letters of Intent and solicit formal proposals
January 2004	Select proposals to be funded in FY04

January 2004 Submit FY06 Climate Initiative to NCO with funding request for NCTP

NCTP Performance Measures for FY03

1. Fund at least three prototype projects with “seed” money
2. Establish formal program management structure
3. Develop program announcement
4. Submit FY05 Climate Initiative to NCO with funding request for NCTP
5. Report program success to NCO management

APPENDIX 4
Plan for the Western Region's Climate Services Program
November 5, 2002

Authors:

Andrea Bair (HCSD)
Julie Adolphson (WFO Glasgow)
Brad Colman (WFO Seattle)
Duane Dykema (WFO San Francisco Bay Area)
Mike Huston (WFO Pocatello)
Austin Jamison (WFO Phoenix)
Judy Koepsell (OCWWS/CSD)
Jon Mittelstadt (WFO Pendleton)

NOTE: The Western Region's climate services plan has been included as guidance only. Undoubtedly, other regional plans will differ from this plan and reflect regional and local uniqueness. The key element in all regional and local climate services plans is how they address the five mission goals of NWS Climate Services.

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1. Introduction

Climate monitoring and prediction are essential to fulfilling the NWS mission of mitigating loss of life and property. Climate variability and predictability have important impacts on the vitality of the nation, from the storm next week to long-term climate conditions such as drought. The NWS plays a vital role in providing climate-related services to the nation, involving all levels of the NWS structure, from the national level to the local office level.

A rapid increase in demand for climate services has resulted in many organizations developing independent programs ranging from basic science to product development and delivery. Partnerships are necessary to better serve the growing demand for services and to better respond to this rapidly evolving science.

While the NWS has been involved in the production and delivery of climate products for many years, this role has become less well defined as more organizations become involved. The management of the Western Region recognized the need for more clearly defining the role of the NWS field offices in producing and delivering climate products and services and felt that a consistent, well-defined program would better serve NWS customers. As a result, late in 2001 the Western Region Director appointed a Climate Services Program Manager and established a WFO steering committee with the mandate to identify a path for the Western Region. In addition, Climate Services Focal Points were established, one at each local WFO. Over the past months, the Climate Services Steering Committee, under the leadership of the Western Region Climate Services Program Manager, has designed a plan for the climate services program within the Region. The RFCs also play a unique and vital role in Climate Services, and this will be addressed in a separate proposal, at a later date.

An overview of the program, including organizational structure, and its relationship to the broader climate community, along with a detailed description of the local office involvement is given in Section 2. Section 3 includes a description of ongoing activities as well as a set of initial steps that will lead to the implementation of Western Region's Climate program.

2. Program Overview

A. National Structure of Climate Services

Several diverse groups within NOAA cooperate to provide climate services, as presented schematically in Fig. 1. NOAA's Climate Observations and Services Program (COSP) Office provides the highest level oversight in providing these services. Within the NWS,

the Office of Climate, Water, and Weather Services (OCWWS)' Climate Services Division (CSD) provide national leadership. The regional structure of the proposed program consists of a Climate Services Program Manager, with the support of a steering committee, and climate focal points. The WFO and RFC focal points guide the climate services program at the local level and provide feedback to the Regional program manager.

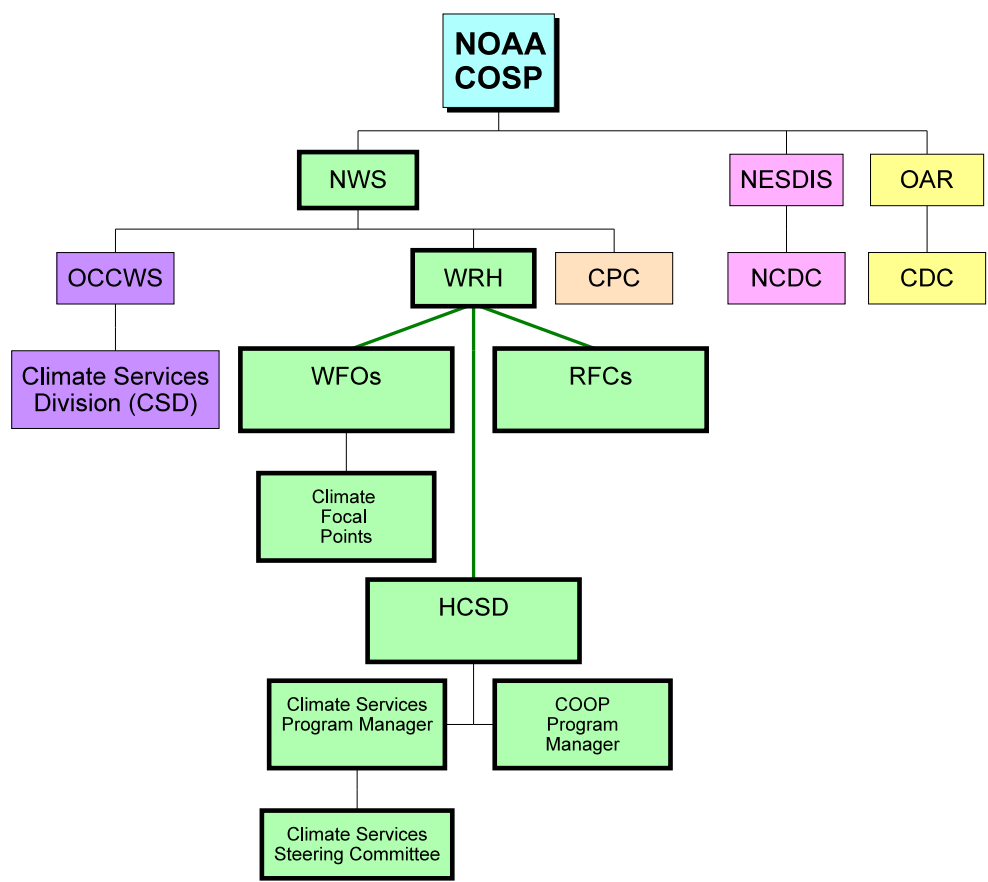


Figure 1: Western Region’s role in NOAA’s Climate Services structure

The delivery of climate services requires the cooperation of many entities, both public and private. Figure 2 shows several of the primary entities that interact with the WR Climate Services Program. The arrows have barbs on both ends, representing the two-way exchange of information between Western Region and its partners.

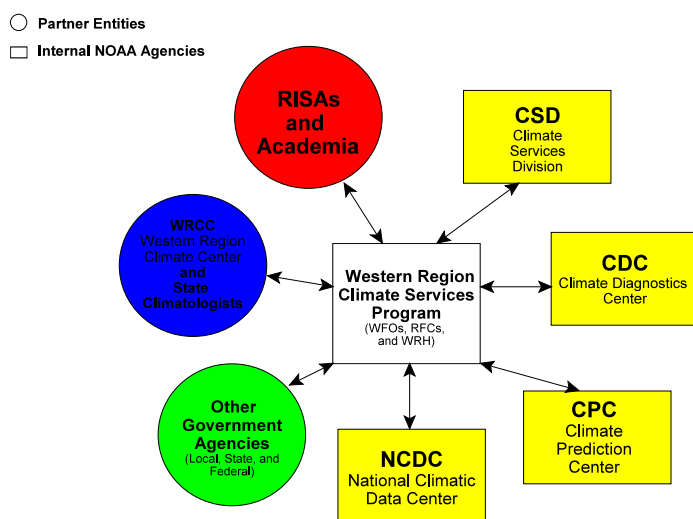


Figure 2: The public and private entities that NWS WR office interact with for Climate Services

Four of the groups shown in Fig. 2 are within NOAA: the Climate Services Division (CSD), the Climate Prediction Center (CPC), the National Climatic Data Center (NCDC), and the Climate Diagnostics Center (CDC). CSD and CPC are also internal to the NWS (see Fig. 1) and not surprisingly these two groups typically work closest with the region and field offices. CDC's mission is research and the development of experimental products, primarily in support of CPC. CDC's relationship with CPC is similar to the one that exists between the National Severe Storms Laboratory (NSSL) and the Storm Prediction Center (SPC).

Requests for data from the public and from agencies outside the NWS are frequently received at forecast offices. When a Western Region forecast office is unable to provide the requested data, customers are directed to the National Climatic Data Center (NCDC), the Western Region Climate Center (WRCC) and/or to a State Climatologist. Forecast offices also consult with and receive archived data from these agencies when conducting local research studies.

There are many partnerships, both formal and informal, between Western Region offices and academic research groups. These partnerships provide an important bridge between climate research in academia and operations. Other links between research and operations are provided by the NOAA funded Regional Integrated Science Assessments (RISAs). A majority of RISAs are at western U.S. locations, including the University of Washington, University of Arizona, Colorado University, the WRCC in Reno, and in San Diego (SCRIPPS).

Many other local, state and federal agencies share information with Western Region forecast offices. For example, local public land agencies like the National Forest Service frequently provide information about local fuel moisture conditions to forecast offices. This information can then be provided to CPC during conference call discussions of the U.S Hazards Assessment and Drought Outlook.

B. Climate Services Components for the WFO

The Climate Services Steering Committee has identified four components that are central to forming a viable climate services program for Western Region: data stewardship, information delivery, science and training, and enhanced or new relationships with partners and customers. The structure and interrelationships of these four components are presented schematically in Figure 3 and descriptively below.

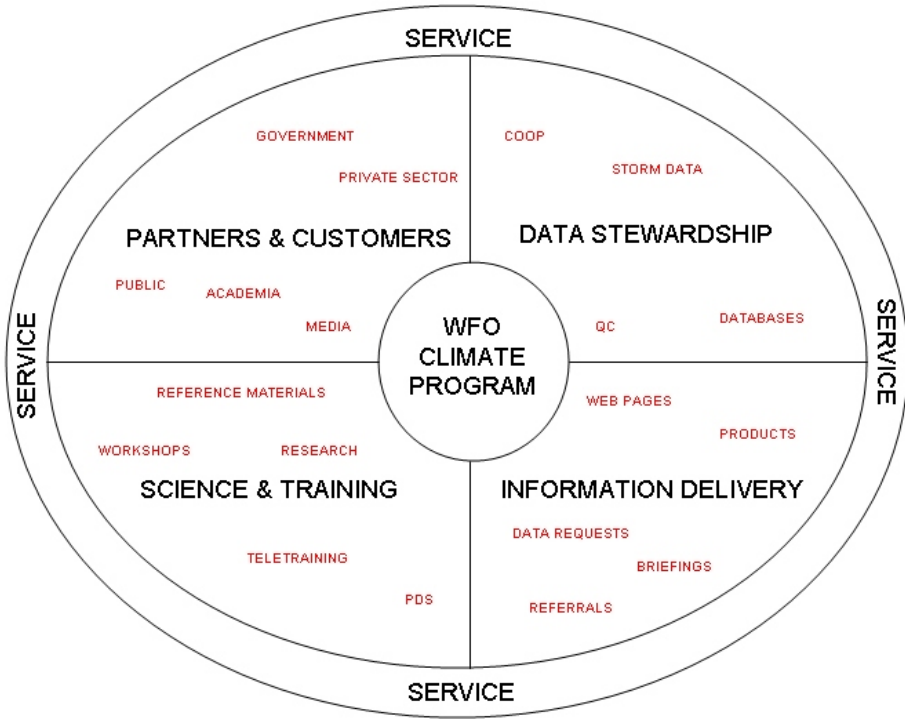


Figure 3: Four components that make up a viable Climate Services Program

Data Stewardship – Assessing and understanding climate from the local scale to the global scale requires accurate and easily available climate records. This requires the careful stewardship of hydrometeorological data, including their collection, quality control, and archival. Locally, the WFO's most important function relates to data from their respective CWA. In many cases, the responsibility for these functions is shared with local, regional, and national climate partners.

Two of the most important data types managed at a Forecast Office are Cooperative Observing Program (COOP) data and Stormdata. The quality control and archiving of these national data sets are done both locally and in partnership with NCDC, regional climate centers, and state climatologists. To efficiently serve local customers, WFOs must also maintain a local archive of easily-accessible and up-to-date data.

A successful data program can not be achieved without a full appreciation of the importance of the data beyond the local level. The Western Region climate services program includes elements to ensure a more broadly coordinated program. Many of the functions of a successful data stewardship program at a WFO are already in place. However, other important functions are still required. A local climate program should include:

- 1) Operation of a well-maintained cooperative observing network with dedicated and properly trained observers
 - a) observing equipment must be kept in good working order
 - b) observers must be trained to provide reliable information and data
- 2) Maintenance of limited local databases for the storage and manipulation of high-demand climate data
 - a) the XMClimate software is an effective tool for accessing routine climate records and performing higher level queries
 - b) Stormdata, ASOS, upper-air observations are other likely candidates for local archival
- 3) Monitoring observations closely and reporting identified problems to the responsible agency. More specifically:
 - a) identify values that are physically unrealistic but might be otherwise missed by automated quality control routines
 - b) ensure observing platforms are repaired and functioning within specifications
 - c) report data outages in a timely manner to minimize the impact of missing data

Information Delivery – Providing accurate, high quality information and data is the core of climate services. The methods by which the NWS WFO delivers this information includes the Internet, providing data, referrals to other climate information sources, providing briefings and other outreach activities, and routinely-disseminated products. Establishing optimal methods of communication among national, regional, and local NWS entities are essential for delivering consistent and coordinated climate information.

Information delivery entails the various methodologies for conveying/relaying climate information and education. In order to be useful, climate information must be communicated effectively. This requires the compilation of various products, speaking to customers and partners with “one voice,” and making the information readily available. A local climate program should include:

1) Products

- a) Tabular – RTP/STP, F6, CLI, LSR, CLM, USDA Crop reports, and others
- b) Narrative
 - 1) RER, PNS
 - 2) nationally-produced forecasts (eg. 6-10 day, 8-14 day, monthly, seasonal)
 - 3) extended outlooks based on national forecasts refined by local studies
 - 4) tech memos, attachments
- c) Graphical representations of some of the above

2) Dissemination

- a) Electronic: NWWS/wire services, Web
- b) Media – interviews, workshops, press releases, Q and As, and direct contact
- c) NWR

3) Public Outreach

- a) Presentations
- b) Direct Contact
 - 1) answering phone or email requests
 - 2) referrals to proper climate source

4) One NWS voice – establish the most effective means of ensuring consistent climate information is provided to WR customers

- a) Intra-WFO – consistency amongst operational and administrative staff (one voice relaying information such as CPC forecasts, explanations of climate phenomena, etc.)

- b) Inter-WFO – consistency among adjacent offices and/or those that cover the same state, when communicating climate information
- c) CPC/NWSH – communication between CPC, NWSH, and the local offices
- d) Climate related press releases – coordinating a “heads up” before major climate announcements and press releases

Science and Training – Science and training are essential components in the formation and development of a successful WR climate services program.

While the bulk of scientific research and investigation is conducted across the broader climate community, WFOs should be encouraged to study local climate factors in collaboration with research partners. These local studies will be used to provide improved service to their partners and customers.

A comprehensive climate training program is required to ensure forecasters acquire the knowledge and skills necessary to provide quality climate services. Certain training materials are under development, including the climate Professional Development Series (PDS), workshops, reference materials, and teletraining opportunities. As new advances in the science of climate are realized, training must evolve to meet the needs of the WR climate services program. A local climate program should include:

1) Science

- a) Provide staff tools to conduct local studies
 - 1) a “how to” guide with examples
 - 2) what data sets are available
- b) Develop downscaling procedures for use in local offices
- c) Incorporate downscaling procedures in local offices
- d) Assess resources available [funding, computing time, partnerships (e.g., universities or state climatologist office)]
- e) Conduct studies and present results to staff
- f) Share results with local climate partners and customers

2) Training

- a) Review and complete Professional Development Series (PDS) activities
 - 1) attend climate symposium
 - 2) participate in climate teletraining
 - 3) complete web-based activities
- b) Participate in climate-related workshops
- c) Create methods for communicating information
- d) Review reference materials and share information with staff
- e) Develop “primer” to help those who haven’t/can’t attend symposium
 - 1) can be used as a resource in local studies
 - 2) can be used as a statistics refresher

Partners and Customers – The rapid advances in climate research and growth of operational programs have roots in academia, government, and the private sector. Furthermore, consumers of climate information and services are very diverse, ranging from government agencies and the private sector to the media and the general public. Recognizing these important and complex interactions, partners and customers form a cornerstone of the proposed WR climate services program. WFOs should strive to identify new partners and customers and strengthen, where possible, existing relationships. Successful efforts in these areas will reduce conflict, minimize redundancy, and optimize information delivery.

Partnerships take many forms and generally involve a supportive exchange between entities. In essence, a partnership is a relationship. It can be informal in nature, or be established through formal agreement. Conversely customers involve those entities that require service-related products, but generally do not desire to sustain or participate in an ongoing dialogue. Collectively, these relationships play a key role in the ability of a WFO to provide climate-related products and services by serving as pathways for information and ideas.

The partnerships involving WFO climate services fall into two main categories: internal and external. Internal partnerships involve interactions between entities that are confined within the NWS such as CPC, regional/national headquarters, and other WFOs. External partnerships involve entities outside of the NWS such as other NOAA agencies, regional climate centers (RCCs), state climatologists, universities, and other government agencies. Individually, many of these entities are both a partner and a customer. Both external and internal partnerships have common themes including coordination, input, and feedback. A local climate program should include:

- 1) Maintenance and enhancement of existing relationships between partners and customers by:
 - a) providing/considering pre-decisional input on forecasts, policies, funding, etc
 - b) soliciting feedback and responding to identifiable deficiencies in processes
- 2) Engaging potential new partners and customers who may benefit from climate services
- 3) Providing consistent and quality services at the local, regional, and national level (i.e., speaking with “one voice”)
- 4) Participating in the active exchange of knowledge between partners through research, planning, workshops, etc.
- 5) Reviewing services to minimize redundancies and eliminate competitive efforts with partners and customers

3. Initial Steps Toward Implementation

In order to implement this program within the WR in a timely fashion, the WR's Climate Services Steering Committee recommends the following actions be considered for inclusion in applicable annual operating plans. These actions are not listed in any order of priority. Although many of these actions could be completed in FY03, a number of them may be more feasible to complete at a later date; these have been noted as FY04 recommendations.

A. Western Region Headquarters

- 1) Climate Services Program Manager
 - a) Maintain and enhance the WR's intranet climate services web site with input from the WFOs and RFCs
 - b) Manage the WR's participation in the climate PDS
 - c) Provide list of climate reference materials, including climate web sites
 - d) Organize a WR climate workshop in FY03
 - e) Distribute plan for WR's climate services
 - f) Establish regular climate services focal point conference calls
 - g) Apply for CSD "grant" in FY03
 - h) Select attendees for each climate symposium in FY03
 - i) Attend Climate Diagnostic Workshop in FY03
 - j) Organize two Climate Services Steering Committee meetings in FY03
- 2) Climate Services Steering Committee
 - a) Assess the value of XMClimate
 - b) Participate in a week-long "mini-partnership" meeting in DC in FY03
 - c) Make recommendations for materials to be included in the WFOs' common-knowledge source of climate information
 - d) Assess the need for future climate products, or the inclusion of climate information in existing products
 - e) Assess WFO needs for support from CPC and other climate product producers
 - f) Define the core suite of WFO web products
 - g) Plan the first Climate Focal Point conference to be held late in FY03

B. Weather Forecast Office

- 1) Begin climate training, including PDS
- 2) Ensure the local office Climate section of the website contains the core suite of products specified by the Climate Services Steering Committee
- 3) Establish local policies for climate data use and services
- 4) Determine potential uses of XMClimate in the local office
- 5) Nominate climate symposium participants
- 6) Consider participation in the CSD's Partnership Program in FY03
- 7) Develop a common-knowledge source of climate information

8) Investigate the benefits of local climate studies

4. Conclusion

With a consistent and well-defined climate services program, the Western Region is better able to serve customer needs. In order to achieve this, Western Region has established a Climate Services Manager, a Climate Services Steering Committee, and local climate service focal points. The Steering Committee created this document to provide a framework for Climate Services in WR and to serve as a guide in establishing a robust WR program. The authors hope that the plan provided here will help WR offices identify the strengths and weaknesses of their current climate programs and assist their future development.

The proposal will be reviewed by the Western Region Director and divisions, as well as the WFOs. Upon acceptance, an implementation plan will be developed. At some point in the future, it would be advantageous to establish a rotating Climate Services Advisory Committee to replace the current Steering Committee. This will allow for new ideas, different perspectives, and continued enhancement of the program.

APPENDIX 5
Professional Development Series (PDS) for Climate Services

APPENDIX 5 – Table of Contents

This Professional Development Series (PDS) includes the Professional Competency Units (PCU) listed below

PCU 1: Demonstrate Knowledge of the Infrastructure for Climate Data and Services	A5-1
PCU 2: Demonstrate Understanding of Climate Variability Sufficient to Apply to Local Services	A5-3
PCU 3: Demonstrate Understanding of the Basis and Methodologies of CPC Products	A5-4
PCU 4: Interpret and Apply CPC Products	A5-6
PCU 5: Respond to User Requests for Historical Climate Data and Information, and Provide Public Outreach	A5-7

PCU 1: Demonstrate Knowledge of the Infrastructure for Climate Data and Services

Producer: Eric Luebehusen, CPC

Description of Job Duty Competency to be Achieved

NWS field staff need to identify appropriate sources of climate information.

Description of Need

NWS field staff must provide accurate and consistent climate information to NWS customers, and have a working knowledge of credible sources of information from a wide array of providers.

Specific Job Task Skills and Knowledge

1. Demonstrate knowledge of climate data providers:
 - NESDIS/NCDC
 - Regional Climate Centers
 - Universities
 - OAR/OGP Integrated Regional Assessments
 - Cooperative Institutes
 - State Climatologists
 - OAR Laboratories (e.g., CDC, PMEL, AOML, FSL, GLERL)
 - Local sources (e.g., office, cooperative observers)
 - USDA, USGS, COE, Bureau of Land Management, Bureau of Reclamation
2. Demonstrate knowledge of providers of climate forecasts:
 - CPC
 - Experimental (e.g., IRI, CDC, CPC)
 - Private sector
 - Regional Climate Centers (RCCs)/State Climatologists
 - Other national weather services (e.g., UKMO)
3. Demonstrate knowledge of providers of information on climate variability (e.g., global warming):
 - Official NOAA sources (e.g., CPC, CDC)
 - Universities
 - Other government labs
 - Private organizations (e.g., EPRI)
 - International Organizations (e.g., IPCC)
 - RCCs/State Climatologists

Instructional Components

Instructional Component 1.1: PDS Team recommends the development of a web site to assist field staff with finding appropriate climate information.

PCU 2: Demonstrate Understanding of Climate Variability Sufficient to Apply to Local Services

Producers: Deirdre Kann, WFO ABQ, and COMET

Description of Job Duty Competency to be Achieved

NWS field staff must be familiar with important aspects of climate variability currently used in climate monitoring and prediction.

Description of Need

NWS staff must understand how climate fluctuations affect local weather variability in order to:

1. Incorporate this understanding into local products and services.
2. Explain climate issues to the public.

Specific Job Task Skills and Knowledge

1. Demonstrate familiarity with the definition, description, teleconnections and predictability of the following components:
 - ENSO
 - AO/NAO
 - PDO
 - MJO
 - Monsoonal systems
 - Land surface processes
 - Drought genesis and maintenance
 - Volcanic effects
 - Solar and lunar variabilities
 - Anthropogenic effects and global change
 - Internal modes of variability
 - Thermohaline circulation

Instructional Components

Instructional Component 2.1: PDS Team recommends a 1-week Symposium for SOOs and/or Climate Focal Points with supporting web-based materials.

PCU 3: Demonstrate Understanding of the Basis and Methodologies of Climate Prediction Center (CPC) Products

Producer: Ed O'Lenic, CPC

Description of Job Duty Competency to be Achieved

NWS field staff must have an understanding of the processes used to generate CPC climate forecasts. This includes philosophical approach, predictive tools, steps for integrating those tools, and the performance characteristics of the tools and forecasts.

Description of Need

NWS field staff must understand the foundation of CPC products in order to integrate climatic factors into local products and services. This information is needed to maximize the effectiveness of customer outreach.

Specific Job Task Skills and Knowledge

1. Demonstrate familiarity with CPC product suite:
 - a. Forecast products:
 - Seasonal Long lead forecasts
 - Monthly long lead forecasts
 - 6-10 day and week 2 forecasts
 - U.S. Threats Assessment
 - HDD / CDD forecasts
 - SST forecasts
 - Excessive heat forecast
 - UVI forecast
 - Hurricane/Tropical Storm outlook
 - 2 season drought outlook
 - b. Monitoring / Diagnostic Products:
 - ENSO advisories
 - Drought monitor
 - Monthly Climate Diagnostics Bulletin
 - Weekly Weather and Crop Bulletin
 - Special Bulletins and Summaries
 - Other derived monitoring and diagnostic products

2. Demonstrate knowledge of how products are produced:
 - Philosophical basis
 - Model tools
 - Human integration of tools
 - Algorithms for derived monitoring and diagnostic products
3. Demonstrate familiarity with CPC operational production schedule.
4. Demonstrate familiarity with performance characteristics of forecast tools and products:
 - Hindcast verification statistics of tools
 - Real-time verification statistics of forecasts and tools

Instructional Components

Instructional Component 3.1: PDS Team recommends developing a distance learning presentation (e.g., web-based, teletraining) to address the training needs described in this PCU.

PCU 4: Interpret and Apply Climate Prediction Center (CPC) Products

Producer: Julie Adolphson, WFO GGW

Description of Job Duty Competency to be Achieved

NWS staff must extend their knowledge of CPC products and services into locally-tailored products, services and studies.

Description of Need

NWS staff must create a seamless suite of products and services which account for local factors on varied spatial and temporal scales. Application of CPC products and methods is required to incorporate climate information into local studies.

Specific Job Task Skills and Knowledge

1. Incorporate CPC short range climate forecasts into local forecast products and services.
2. Using knowledge of relevant statistical analysis techniques, conduct studies to apply CPC products locally.
3. Add local detail to CPC forecasts.

Instructional Components

Instructional Component 4.1: PDS Team recommends developing a distance learning presentation (e.g., Web-based, teletraining) to address many of the training needs described in this PCU. Also, a portion of the Symposium recommended in PCU2 should include instruction on necessary statistical tools mentioned above. Finally, collaborative studies between NWS field staff and research institutions should be initiated.

PCU 5: Respond to User Requests for Historical Climate Data and Information, and Provide Public Outreach

Producers: Chuck McGill, WFO BTV and OCWWS Climate Services Division

Description of Job Duty Competency to be Achieved

NWS field staff must integrate knowledge, skills and abilities obtained in PCUs 1 through 4 to respond to users in a concise and timely manner. Field staff must also inform customers on the availability and use of NOAA climate products and services.

Description of Need

A large majority of incoming calls to NWS field offices pertain to climate services requests. NWS field staff must be adequately trained to handle these requests and conduct outreach activities.

Specific Job Task Skills and Knowledge

1. Demonstrate ability to respond effectively to climate requests from customers (e.g., HDD/CDD, Drought Indices, Normals, local data).
2. Convey climate information to the public via outreach activities.
3. Interpret climate products and information in response to customer requests and needs.
4. Climate focal point should develop local data sets to respond to customer requests, subject to national policy.

Instructional Components

Instructional Component 5.1: Office WCM should coordinate public outreach activities and assist staff in developing and delivering outreach materials. Provide web-based instruction on how to develop a local climate database with emphasis on examples.

APPENDIX 6
National Weather Service's
Current and Planned Climate Services Training Activities

APPENDIX 6– National Weather Service’s Current and Planned Climate Services Training Activities

The goal of the current and planned climate services training activities is to ensure field staff (1) possess knowledge of the infrastructure for climate data and services, (2) understand climate variability sufficient to be able to apply to local services, (3) understand the basis of operational climate prediction products, including how to interpret and apply these products, and (4) can respond to user requests for historical climate data and information, as well as provide public outreach.

Currently, NWS is:

- Providing Climate Variability Symposia at the NWS/Cooperative Program for Operational Meteorology, Education and Training (COMET) in Boulder, Colorado. Background on climate variability and change, the latest developments in climate analysis and prediction, and methods for documenting and forecasting local climate fluctuations are provided.
- Converting key lectures from the Symposia to “webcast” format, allowing convenient access to Symposia via the World Wide Web. By the end of FY 2003, NWS plans to have a total of five lectures available on-line.
- Planning to develop two climate training websites. The websites will contain reference materials for climate information and predictions, and self-guided and interactive exercises on the interpretation/use of NOAA Climate Prediction Center (CPC) products, respectively.
- Preparing to offer three, 1.5-hour teletraining sessions featuring live instructor voice by the end of this fiscal year. The three sessions focus on, respectively, (1) explaining how to navigate the CPC website and become acquainted with climate products, (2) discussing how to interpret CPC medium range (6 to 10 days, week two) forecasts, and (3) demonstrating the modes of climate variability used in climate prediction.
- Providing hands-on training at CPC and the NWS’ Climate Services Division (CSD) through its Partnership Program for 10-20 qualified and highly-motivated field personnel each year.

Plans for 2004 and Beyond:

- Continue workshops to ensure at least one staff member has attended from each NWS field site, as well as each Regional and National Headquarters. NWS will continue the course after FY 2004 on an annual or biannual basis to maintain the level of training and entrain new talent.
- Increase the number of recorded Symposia lectures for access on line to 20 by the end of FY 2004.
- Add three more topics to the teletraining agenda in 2004.
- Design a new training module to educate field personnel on the importance to the climate record of sound stewardship of observational platforms, sites, instruments, and procedures for which they are responsible.
- Continue CPC/CSD hands-on training each year.

APPENDIX 7
Time Line of Actions for Implementation of Plan

APPENDIX 7 – Time Line of Actions for Implementation of Plan

NWS Headquarters

FY03

- Q2 Designate an NWS Headquarters program manager for regional climate services (Goal 1)
- Q2* Manage and allocate resources (i.e., funding, personnel, training, etc.) for climate services (Goal 1)
- Q2* Manage the climate services Partnership Program (Goal 1)
- Q2* Provide guidance and tools (i.e., ICs) for professional development in the area of climate science and services (Goal 1)
- Q2* Provide input to CPC and management support for coordination of input from regions and partners to CPC on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others (ref. Appendix 2) (Goal 3)
- Q2* Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, “New and Enhanced Products and Services” (Goal 3)
- Q2* Solicit feedback at monthly teleconferences with regional climate services program managers/leaders to improve existing climate services products and for the design of new ones (Goal 3)
- Q2* Provide materials and tools for national climate services outreach (Goal 4)
- Q2* Coordinate and conduct outreach to customers and users on climate services and products (Goal 4)
- Q2* Identify customer requirements for climate services (Goal 4)
- Q2* Engage partners in climate outreach activities (Goal 4)
- Q2* Identify climate partners (Goal 5)
- Q2* Collaborate with the climate community on expansion, improvement, and delivery of NWS climate services (Goal 5)
- Q3* Participate, when applicable, as instructors and participants in the COMET climate symposia (Goal 1)
- Q4* Provide primary assistance in the development of regional and local climate services plans (Goal 1)
- Q4 Develop outreach materials for use by field and volunteer observers on the importance of accurate observations and metadata (Goal 2)
- Q4* Develop data continuity plans for observing systems (Goal 2)
- Q4* Develop and maintain national standards for instrument accuracy and exposure, data quality, and timeliness (Goal 2)

* Actions ongoing following deadline

FY04

- Q1* Create national climate services policy and directives based on approved national climate services plan (Goal 1)
- Q1* Update and maintain the climate Professional Development Series (PDS) and complete development of all Instructional Components (ICs) (Goal 1)
- Q1 Develop policy so in situ observing programs can adhere to the “10 climate monitoring principles” (reference Appendix 1) (Goal 2)
- Q1 Develop policy for the collection, maintenance, and dissemination of timely and accurate metadata (Goal 2)
- Q1 Develop policy for the integration of complementary data into an integrated national observation network (Goal 2)
- Q1 Develop a strategic plan for the NWS part of a national climate observation network, leveraging the NWS in-situ networks (Goal 2)
- Q1* Facilitate communication among regions, field offices, and members of the climate community in the development of products (Goal 3)
- Q1* Facilitate communication among climate partners in the joint development of products (Goal 5)
- Q4 Develop national standards for dissemination of climate observations and data products (Goal 2)
- Q4* Conduct at least three climate outreach activities per year, including two face-to-face activities (Goal 4)

FY05

- Q1 Provide guidance to regions for conducting regional and local studies (reference Appendix 2) (Goal 3)
- Q2 Facilitate coordination between NCEP and regions in generating techniques to produce local conditional climatologies based on modes of climate variability (reference Appendix 2) (Goal 3)
- Q2 Facilitate coordination between NCEP and regions in generating guidance and methodologies to quantitatively downscale CPC forecast products (reference Appendix 2) (Goal 3)

NCEP

FY03

- Q2 Designate a liaison for regional climate services (Goal 1)
- Q2* Manage and allocate personnel for climate services (Goal 1)
- Q2* Provide instructional guidance to Partnership Program participants (Goal 1)
- Q2* Assist CSD in providing guidance and tools for professional development in the area of climate science and services (Goal 1)

* Actions ongoing following deadline

- Q2* Solicit and synthesize input from regions and partners on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others (reference Appendix 2) (Goal 3)
- Q2* Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (Goal 3)
- Q2* Receive and respond to feedback to improve existing climate products and to develop new ones (Goal 3)
- Q2* Provide support to developing materials and tools for national climate services outreach (Goal 4)
- Q2* Provide support, as needed, in identifying customer requirements for climate services (Goal 4)
- Q2* Assist NWS headquarters in engaging partners for climate outreach activities (Goal 4)
- Q2* Provide input in identifying climate partners (Goal 5)
- Q2* Collaborate with the climate community on expansion, improvement, and delivery of NWS climate services (Goal 5)
- Q3* Participate, when applicable, as instructors and participants in the COMET climate symposia (Goal 1)
- Q4* Provide technical assistance, as needed, in the development of regional and local climate services plans (Goal 1)
- Q4 Collaborate with NWS Headquarters to ensure that quality examples, reflecting the importance of accurate observations and metadata, are included in outreach materials for use by field and volunteer observers on the importance of accurate observations and metadata (Goal 2)
- Q4* Provide input for data continuity plans to national headquarters, as appropriate (Goal 2)
- Q4* Provide requirements to NWS Headquarters, as needed, on developing and maintaining national standards for instrument accuracy and exposure, data quality, and timeliness (Goal 2)
- Q4* Participate, as needed, in climate outreach activities (Goal 4)
- Q4* Support outreach to customers and users on climate services and products (Goal 4)

FY04

- Q1* Implement the national climate services policy and directives, and supplement, as necessary (Goal 1)
- Q1* Provide technical and instructional support to IC development and execution (Goal 1)
- Q1 Ensure NCEP user requirements are addressed within the strategic plan for the NWS part of a national climate observation network (Goal 2)

* Actions ongoing following deadline

- Q1 Provide input on policy for adherence to the “10 climate monitoring principles” (Appendix 1) to national headquarters, as appropriate (Goal 2)
- Q1 Provide input on the policy for the collection, maintenance, and dissemination of timely and accurate metadata to national headquarters, as appropriate (Goal 2)
- Q1 Provide user input into the development of standards for an integrated national observation network (Goal 2)
- Q1* Receive and respond to feedback from national and regional members of the climate community, regions, and field offices to facilitate development of products (Goal 3)
- Q1* Communicate with national and regional climate partners to facilitate joint development of products (Goal 5)

FY05

- Q1* Ensure data products meet national standards for dissemination of climate observations and data products (Goal 2)
- Q1 Provide tools to regions for conducting regional and local studies (reference Appendix 2) (Goal 3)
- Q2 Develop, with regions, techniques for all local offices to use in generating local conditional climatologies based on modes of climate variability (reference Appendix 2) (Goal 3)
- Q2 Develop, with regions, guidance and methodologies for all local offices to quantitatively downscale CPC forecast products (reference Appendix 2) (Goal 3)

Regional Headquarters

FY03

- Q2 Appoint a Regional Climate Services Program Manager/Leader (Goal 1)
- Q4* Ensure that the regional climate services program manager/leader participates in the CSD’s Partnership Program (Goal 1)
- Q4* Manage and allocate resources (i.e., funding, personnel, training, etc.) for climate services (Goal 1)
- Q4* Ensure that the regional climate services program manager/leader attends a COMET climate symposium and manage attendance by local offices’ climate focal points (Goal 1)
- Q4* Ensure professional development in the area of climate science and services for the regional climate services program manager/leader and assist with such professional development for the climate focal points (Goal 1)
- Q4* Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, “New and Enhanced Products and Services” (Goal 3)

* Actions ongoing following deadline

- Q4* Solicit feedback from local offices and regional customers for monthly teleconferences with CSD to improve existing climate services products and for the design of new ones (Goal 3)
- Q4* Collect, synthesize, and communicate input from partners and local offices to CPC on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others (reference Appendix 2) (Goal 3)
- Q4* Encourage partnerships between regional and local offices for climate outreach activities, and engage regional partners (Goal 4)
- Q4* Identify customer requirements for regional and local climate services (Goal 4)

FY04

- Q1 Develop and implement a regional climate services plan based on the national plan (Goal 1)
- Q1 Distribute outreach materials for use by field and volunteer observers on the importance of accurate observations and metadata to field and volunteer observers, and conduct outreach activities (Goal 2)
- Q1* Ensure that NWS observing systems are managed with data continuity plans (Goal 2)
- Q1* Monitor observations network performance to ensure that national standards are met for instrument accuracy and exposure, data quality, and timeliness (Goal 2)
- Q1* Provide materials and tools for regional climate services outreach (Goal 4)
- Q1* Coordinate and conduct outreach to regional customers and users on regional and local climate services and products (Goal 4)
- Q1* Set yearly goals for regional and local offices for number of climate outreach activities per year, including face-to-face interactions, and conduct at least the target number of climate outreach activities (Goal 4)
- Q1* Identify regional and local climate partners (Goal 5)
- Q1* Collaborate with regional climate services partners on expansion, improvement, and delivery of regional and local climate services (Goal 5)
- Q2* Implement the national climate services policy and directives, and supplement, as necessary (Goal 1)
- Q2* Coordinate regional participation in climate PDS (Goal 1)
- Q2 Facilitate COOP modernization activities per the strategic plan for the NWS part of a national climate observation network (Goal 2)
- Q2 Supplement policy for the collection, maintenance, and dissemination of timely and accurate metadata, as necessary, and ensure two-way regional coordination with climate services partners. Implement and ensure adherence to the national policy (Goal 2)
- Q2 Supplement, as necessary, national policy so in situ observing programs can adhere to the “10 climate monitoring principles” (reference Appendix 1) (Goal 2)

* Actions ongoing following deadline

- Q2* Supplement national policy, as necessary, to ensure regional coordination and integration of complementary data into an integrated national observation network (Goal 2)
- Q2* Support flow of information among field offices, NWS headquarters, and regional members of the climate community, and collaborate to develop joint regional products (Goal 3)
- Q2* Facilitate communication with regional and local climate partners, and collaborate to develop joint regional products (Goal 5)

FY05

- Q2* Ensure regional and local observations and data products meet national standards for dissemination of climate observations and data products (Goal 2)
- Q2* Investigate opportunities for regional and local studies, use guidance and tools to conduct regional studies, and provide guidance and tools to local offices for conducting local studies (reference Appendix 2) (Goal 3)
- Q3 Support development of techniques for local offices to use in generating local conditional climatologies and, where needed, serve as a testbed for transition to operations (reference Appendix 2) (Goal 3)
- Q3 Support development of guidance and downscaling methodologies for all local offices to use and, where needed, serve as a testbed for transition to operations (reference Appendix 2) (Goal 3)

Local Offices (WFOs)

FY03

- Q4 Appoint Climate Focal Points (Goal 1)
- Q4* Provide input to regional headquarters on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others (reference Appendix 2) (Goal 3)
- Q4* Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (Goal 3)
- Q4* Solicit feedback, on a regular basis, from customers to improve existing climate services products and for the design of new ones (Goal 3)

FY04

- Q1* Manage resources (i.e., funding, personnel, training, etc.) for climate services (Goal 1)
- Q1* Ensure professional development in the area of climate science and services for the climate focal point (Goal 1)

* Actions ongoing following deadline

- Q1* Ensure the attendance of at least one qualified staff member (preferably, the climate focal point) to attend a COMET climate symposium, who will train the office upon return (Goal 1)
- Q1* Encourage participation of climate focal point in the CSD's Partnership Program (Goal 1)
- Q1* Ensure that NWS observing systems are managed with data continuity plans (Goal 2)
- Q1* Monitor local observations network performance and respond to network problems in a timely manner (Goal 2)
- Q1* Identify customer requirements for local climate services (Goal 4)
- Q1* Engage partners in climate outreach activities (Goal 4)
- Q1* Identify local climate partners (Goal 5)
- Q1* Collaborate with local climate services partners on expansion, improvement, and delivery of local climate services (Goal 5)
- Q2 Implement regional climate services plan (Goal 1)
- Q2* Schedule and complete appropriate training based on the climate PDS (Goal 1)
- Q2* Educate field and volunteer observers as to the importance of accurate observations and metadata (Goal 2)
- Q2* Provide materials and tools for local climate services outreach (Goal 4)
- Q2* Coordinate and conduct outreach to local customers and users on local climate services and products (Goal 4)
- Q3* Implement national and regional climate services policy and directives, and create local procedures to achieve this (Goal 1)
- Q3 Implement national policy and regional supplement, if applicable, regarding adherence of in situ observing programs to the "10 climate monitoring principles" (reference Appendix 1) (Goal 2)
- Q3 Provide site support for COOP locations per the strategic plan for the NWS part of a national climate observation network (Goal 2)
- Q3 Implement national and regional policies for the collection, maintenance, and dissemination of timely and accurate metadata and ensure two-way coordination with climate services partners (Goal 2)
- Q3* Identify candidate local complementary observation networks for inclusion in an integrated national observation network (Goal 2)
- Q3* Collaborate and partner with other field offices and members of the climate community to develop joint products (Goal 3)
- Q3* Collaborate with regional and local climate partners to develop joint products (Goal 5)
- Q4* Conduct at least the number of climate outreach activities set by regional headquarters, including face-to-face interactions (Goal 4)

* Actions ongoing following deadline

FY05

- Q3* Ensure local observations and data products meet national standards for dissemination of climate observations and data products (Goal 2)
- Q3* Investigate opportunities for local studies, and use guidance and tools to conduct studies (reference Appendix 2) (Goal 3)
- Q4 Develop local conditional climatologies based on modes of climate variability (reference Appendix 2) (Goal 3)
- Q4 Develop local climate products downscaled from CPC forecast products (reference Appendix 2) (Goal 3)

Local Offices (RFCs)

FY03

- Q4 Appoint Climate Focal Points (Goal 1)
- Q4 Collaborate with NWS Headquarters to ensure that quality examples, reflecting the importance of accurate observations and metadata, are included (Goal 2)
- Q4* Provide input to regional headquarters on national products such as the Drought Monitor, Drought Outlook, Hazards Assessment, and others (reference Appendix 2) (Goal 3)
- Q4* Follow the existing policy for communicating requirements and feedback as per NWSI 10-102, "New and Enhanced Products and Services" (Goal 3)
- Q4* Provide feedback to regional headquarters and supported WFOs to improve existing climate products and to develop new ones (Goal 3)

FY04

- Q1* Manage resources (i.e., funding, personnel, training, etc.) for climate services (Goal 1)
- Q1* Ensure the attendance of at least one qualified staff member (preferably, the climate focal point) to attend a COMET climate symposium, who will train the office upon return (Goal 1)
- Q1* Ensure professional development in the area of climate science and services for the climate focal point (Goal 1)
- Q1* Encourage participation of climate focal point in the CSD's Partnership Program (Goal 1)
- Q1 Provide input on policy for adherence to the "10 climate monitoring principles" (Appendix 1) to national and regional headquarters, as appropriate (Goal 2)
- Q1 Ensure RFC user requirements are addressed within the strategic plan, for the NWS part of a national climate observation network (Goal 2)

* Actions ongoing following deadline

- Q1 Provide input on the policy for the collection, maintenance, and dissemination of timely and accurate metadata to national and regional headquarters, as appropriate (Goal 2)
- Q1* Provide input for data continuity plans to national headquarters, as appropriate (Goal 2)
- Q1* Provide requirements to NWS Headquarters, as needed, on developing and maintaining national standards for instrument accuracy and exposure, data quality, and timeliness (Goal 2)
- Q1* Identify customer requirements for hydrologic climatology services (Goal 4)
- Q1* As applicable, engage partners in climate outreach activities (Goal 4)
- Q1* Identify local climate partners (Goal 5)
- Q1* Collaborate with local climate services partners on expansion, improvement, and delivery of local climate services (Goal 5)
- Q2 Implement regional climate services plan (Goal 1)
- Q2* Schedule and complete appropriate training based on the climate PDS (Goal 1)
- Q2* Provide hydrologic climatology materials and tools for climate services outreach (Goal 4)
- Q2* Coordinate and conduct outreach to local customers and users on hydrologic climatology services and products (Goal 4)
- Q3* Implement national and regional climate services policy and directives, and create local procedures to achieve this (Goal 1)
- Q3 Provide user input into the development of standards for an integrated national observation network (Goal 2)
- Q3* Support affiliated WFOs in the development of joint products (Goal 3)
- Q3* Collaborate with regional and local climate partners to develop joint products (Goal 5)
- Q4* Conduct at least the number of climate outreach activities set by regional headquarters, including face-to-face interactions (Goal 4)

FY05

- Q3* Ensure data products meet national standards for dissemination of climate observations and data products (Goal 2)
- Q3* Investigate opportunities for local studies, and use guidance and tools to conduct studies (Goal 3)
- Q4 Coordinate and mosaic local conditional climatologies from WFOs (Goal 3)
- Q4 Support WFO development of local hydrologic climatologies and coordinate and mosaic local conditional climatologies from WFOs (reference Appendix 2) (Goal 3)
- Q4 Assure coordination of long-range hydrologic forecasts and local climate predictions for hydrologic service area (Goal 3)

* Actions ongoing following deadline

APPENDIX 8

Acronym Listing

Appendix 8 – Acronym Listing

AASC	American Association of State Climatologists
ABQ	Albuquerque WFO
AO	Arctic Oscillation
AOML	Atlantic Oceanographic & Meteorological Lab
ASOS	Automated Surface Observation System
BASC	Board on Atmospheric Sciences and Climate (NRC)
BTV	Burlington WFO
CCRI	Climate Change Research Initiative
CDC	Climate Diagnostics Center
CDD	Cooling Degree Days
CLI	Climatological Report (Daily)
CLM	Climatological Report (Longer Term)
COE	Corps of Engineers
COMET	Cooperative Program for Operational Meteorology, Education and Training
COOP	Cooperative Observer Program
COSP	Climate Observations and Services Program
CPC	Climate Prediction Center
CSD	Climate Services Division
CWA	County Warning Area
ENSO	El Niño-Southern Oscillation
EPRI	Electric Power Research Institute
F6	Preliminary Climatological Data Form
FSL	Forecast Systems Lab
FY	Fiscal Year
GGW	Glasgow WFO
GLERL	Great Lakes Environmental Research Lab
HCSD	Hydrology and Climate Services Division
HDD	Heating Degree Days
IC	Instructional Component
IPCC	Intergovernmental Panel on Climate Change
IRI	International Research Institute for Climate Prediction
LSR	Local Storm Report
MJO	Madden-Julian Oscillation
NAO	North Atlantic Oscillation
NCDC	National Climatic Data Center
NCEP	National Centers for Environmental Prediction
NCO	NOAA Climate Office
NCTP	NOAA Climate Transition Program
NESDIS	National Environmental Satellite, Data and Information Service
NOAA	National Oceanic and Atmospheric Administration

NRC	National Research Council
NSSL	National Severe Storms Laboratory
NWR	NOAA Weather Radio
NWS	National Weather Service
NWSH	National Weather Service Headquarters
NWSI	National Weather Service Instruction
NWWS	NOAA Weather Wire Service
OAR	Office of Oceanic and Atmospheric Research
OCWWS	Office of Climate, Water, and Weather Services
OGP	Office of Global Programs
PCU	Professional Competency Unit
PDO	Pacific Decadal Oscillation
PDS	Professional Development Series
PEAC	Pacific ENSO (El Niño-Southern Oscillation) Applications Center
PMEL	Pacific Marine Environmental Lab
PNS	Public Information Statement
PR	Pacific Region
Q	Quarter (within a fiscal year)
RBC	River Basin Commission
RDSS	Regional Decision Support and Services
RER	Record Report
RFC	River Forecast Center
RISA	Regional Integrated Sciences and Assessments
RTP	Regional Temperature and Precipitation Table
SOO	Science and Operations Officer
SPC	Storm Prediction Center
SST	Sea Surface Temperature
STP	State Temperature and Precipitation Table
UKMO	United Kingdom Met Office
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UVI	Ultraviolet Index
WCM	Warning Coordination Meteorologist
WFO	Weather Forecast Office
WR	Western Region
WRCC	Western Regional Climate Center

APPENDIX 9
Glossary of Terms

Appendix 9 – Glossary of Terms

Climate – a couple of shortened definitions. . . suitable averages of the climate system over periods of a month or more, taking into consideration the variability in time of these averaged quantities or the statistics of weather

Climate community – includes all of the people and organizations (i.e., research, at all levels, and operations) involved in research and delivery of climate information

Climate partners – people and organizations the NWS works with for the delivery and development of climate services (e.g., state climatologists) – this is a subset of “climate community”

Local conditional climatologies – particular data sets related to specific locations

Methodologies to quantitatively downscale CPC forecast products – approved “best practices” include (in order of preference) 1) statistical downscaling (multiple correlation coefficient) and 2) compositing on ENSO signal, if correlation is low

XMClimate software – developed by Paul Shannon and Carl Dierking of WSFO Juneau. It started as a DOS program, but was ported to X-window/Unix with a netCDF database in the early 90s. There is also a Linux version. The main emphasis of the application is to make retrieval and analysis of large historical climate records as fast and convenient as possible. The application is actually a package of programs and scripts for reading, writing, and managing climate data in netCDF. The most visible program is the Xwindow GUI named “xmclimate”, but there are a number of command-line driven tools and utilities that make it possible to utilize a Web interface to access and search the database. In addition to simple display of daily data, there are a number of special searches that can be done. These include extremes, consecutive day events, frequencies, and first/last occurrences. The package is available on the AWIPS Local Application Web Site along with an HTML user guide. An example can be found at the following link:

<http://pajk.arh.noaa.gov/climatology/webcli.htm>